Briefing note - Estimating tree age in jarrah and marri

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This document summarizes the findings on tree age reported in Whitford (2002), *Hollows in jarrah (Eucalyptus marginata) and marri (Corymbia calophylla) trees: I. Hollow sizes trees attributes and ages,* published in *Forest Ecology and Management*, volume160 pages 201-214.

Counts of growth rings

The age of eucalypt trees can be determined from counts of their annual growth rings. These rings are visible because regular seasonal variations in the density of wood grown onto the outer edge of the tree provide a visible banding of annual growth rings.

Growth rings can be counted on tree stumps, on cross-sections cut from a fallen tree, or from cores removed from the tree bole. The latter method is technically difficult and does not work well on large trees (diameter > 40cm). The problems are: cores are very difficult to collect and extract, the central growth ring is not always in the centre of the tree and this leads to problems in obtaining meaningful cores, cores generally need to be large in diameter, more than one core is needed, a number of large cores removed from a single tree significantly damage that tree. Growth rings are much more difficult to count on cores compared to cross-sections of the tree bole.

Estimating age from tree diameter

The age of trees can be determined from growth rings and then related to the tree diameter. In WA the relationship between tree age and tree diameter has been examined for karri trees (Rayner, 1992), jarrah and marri trees (Faunt, 1992; Burrows et al., 1995; Stoneman et al., 1997; Whitford, 2002), and salmon gum and wandoo (Rose, 1993).

For jarrah and marri trees with diameters up to about 150 cm, a good estimate of age can be determined from the relationship developed by Whitford (2002). For trees which have diameters much greater than 150 cm, these relationships probably over-estimate the age.

Age = 2.345 x DOB + 6.968 n = 162 $r^2 = 0.82$ (1)

Age = 2.378 x DUB + 15.259 n = 161 $r^2 = 0.82$ (2)

Where: DOB is the tree diameter measured in centimetres over the bark at 1.3 m above the ground and DUB is the tree diameter measured in centimetres under the bark at 1.3 m above the ground.

It is important to note that these relationships apply only to unfertilized forest trees. For trees grown in other situations, such as in open paddocks, cleared areas, trees grown on old fertilized agricultural land, fertilized mine rehabilitation or in other situations where the growth rate may have exceeded that typically found in the forests, the age will be over estimated by these equations.

A very small number of trees growing in the forest will be of a very large diameter. It is most likely that these trees have growth rates that are much greater than the typically growth rate for large trees. These trees may be of a very large diameter but their age will be no greater or not substantially greater than the age of more commonly found large trees.

Studies of jarrah, karri and other eucalypts across Australia have shown that eucalypts trees rarely exceed 400 years in age (Helms, 1945; Rayner, 1992). Hickey et al. (1999) suggested that, based on ring counts from an adjacent celery-top pine *Phyllocladus aspleniifolius*, it is possible for old-growth *Eucalyptus delegatensis* in southern Tasmania to be a minimum of 460 years old. It is most unlikely that the ages of the very large trees in the south west forests of WA are much greater than 450 years. These estimates, and the regression equations given above, do not consider or include the time that jarrah trees may have spent growing as a lignotuber.

Growth rates fluctuate widely over the life of a tree and can vary greatly between and within sites. Consequently when tree age is estimated from tree diameter, the size of the error associated with this estimate increases with the size of the tree. This can be seen in figure 7 of Whitford (2002) (below).

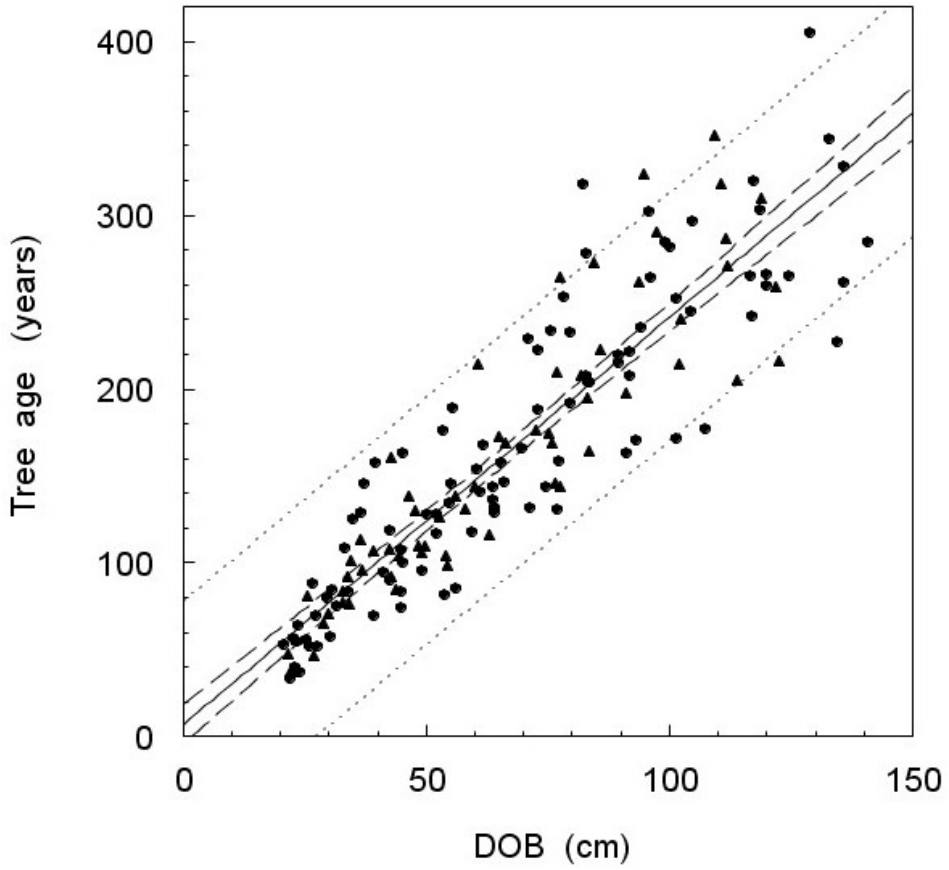

Figure 7. The relationship between the age of jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) trees obtained from counts of annual growth rings, and diameter (at 1.3 m) over bark (DOB).

Average growth rates

A common mistake made in attempting to estimate the age of trees is to use the average growth rate to estimate the age of individual trees. Stoneman et al. (1997) discuss this problem. The largest trees on a site are typically the fastest growing trees. In addition the distribution of tree diameters is skewed, i.e. there are many more small trees in a stand than there are large trees. Consequently the average growth rate determined for a stand of trees will greatly over estimate the age of the largest trees.

References

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